



Improving Coalitions through S&T Cooperation

Dr. Robert S. Walker

**Assistant Deputy Minister (Science & Technology)
& Chief Executive Officer, Defence R&D Canada**



Defence Research and Development Canada Recherche et développement pour la défense Canada

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The New Defence and Security Context

Complex Conflict Spectrum



Asymmetric Threats



Global Economy



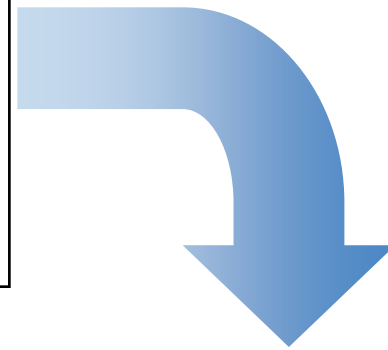
Common Defence and Security Agenda

Globalization of Science and Technology



Defence and Security S&T – Setting the Government's policy context

- *Canada First Defence Strategy*
- Extension of CF's Afghanistan mission through 2011
- National Security Statement
- Northern Strategy
- *Advantage Canada – Federal Government's Economic Strategy*

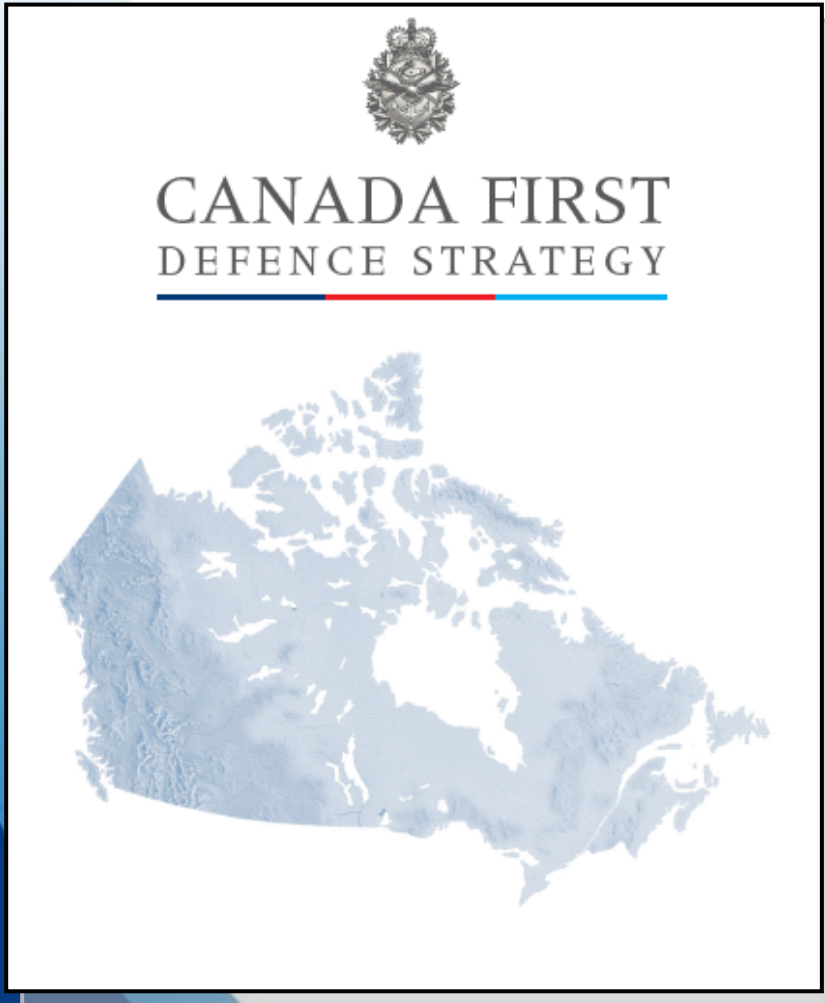


Defence and Security S&T Strategy: *Maximize the impact of S&T on Canadian defence and security capabilities **and** on the nation's innovation capacity*



Canada First Defence Strategy

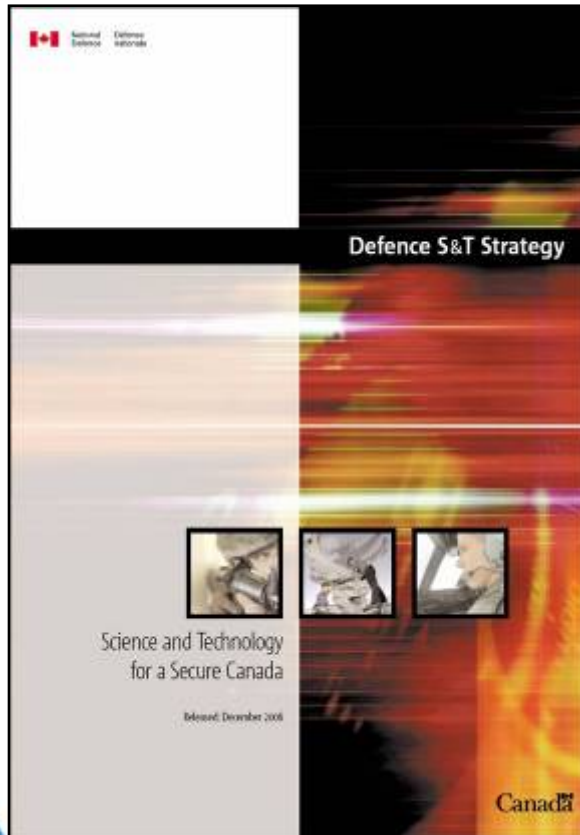
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- Defines the government's *Level of Ambition* for the Canadian Forces
- Recognizes the need to balance the defence investment across people, equipment, infrastructure and readiness
- Links defence expenditures and socio-economic expectations
- Provides a stable, long-term fiscal framework



Defence S&T Strategy – Direction



- Deliver “full-service” S&T that supports all Departmental decision processes.
- Implement an institution-wide governance construct - *the Defence S&T Enterprise*.
- Evolve the role/focus for the internal S&T capability – *excel at S&T Integration*.
- Establish purpose-built internal and external partnerships - *leverage effort and increase exploitation of results*.

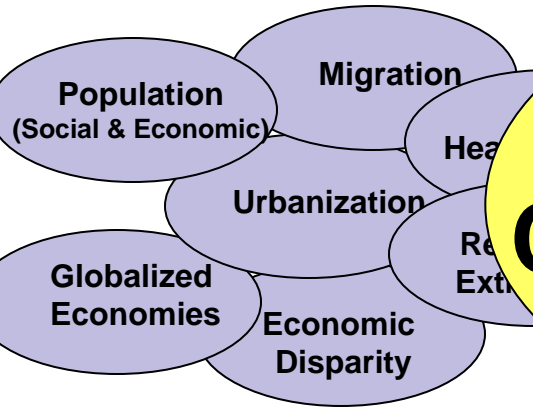


Science & Technology...

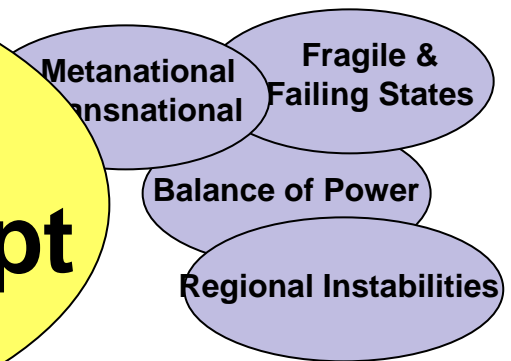
- **Informs emerging Canadian Forces concepts and doctrine**
- **Helps build Canadian Forces capabilities to realize the Canada First Defence Strategy**
- **Helps the CF acquire war-winning technologies – disruptive and enabling**
- **Helps solve Canadian Defence and Security hard problems**

S&T informs Canadian Forces Emerging Concepts and Doctrine

Economic & Social Trends

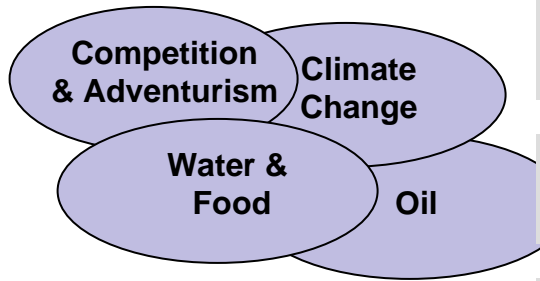


GeoPolitical Trends



CF Integrated Capstone Concept

Environmental & Resource



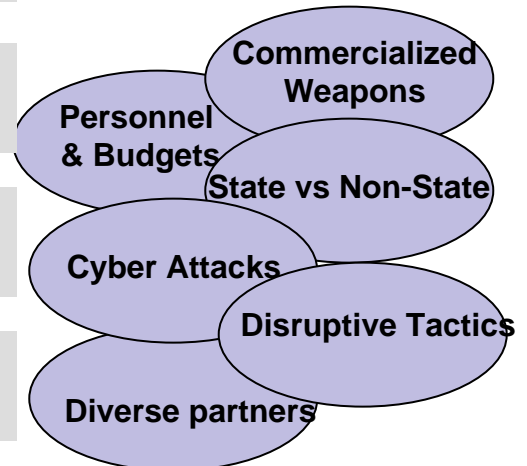
➤ **Comprehensive**

➤ **Integrated**

➤ **Adaptive**

➤ **Networked**

Military & Security





S&T helps build Canadian Forces CFDS Capabilities

- 1. Trusted situational awareness, intent prediction and decision making for achieving operational superiority**
- 2. Robust operational command and control**
- 3. Seamless interoperability with other government departments, other Canadian partners and allied forces in a complex environment**
- 4. Agile, tailored force to deploy and operate in complex environments**
- 5. Full-spectrum protection including from weapons of mass destruction**
- 6. Sustainability, affordability, supportability of operations, assets and people**
- 7. Creation of asymmetric advantage by defeating terrorist groups and tactics**
- 8. Defence policy and force development informed and enabled by S&T developments.**



Potentially disruptive technologies that could provide decisive advantage for the CF

For example ...

- Quantum capabilities
- Autonomous intelligent systems and platforms
- Wide-band mobile wireless networking
- New sensing (hyper-spectral, terahertz)
- Micro-satellites
- Virtual reality and neuro-interfaces
- Non-conventional weapons
- Micro/nano-engineered smart materials
- Novel power sources
- Bio-based solutions (biometrics, bio-signatures, broad spectrum therapies)



S&T helps solve Defence and Security Hard Problems

Defence

- Defeat the “IED System”
- Enhance soldier survivability
- Build an integrated CF C2 system
- Grow the Force (recruit, train, retain, and duty of care)
- Close the gaps in the CF Strategic Capability Roadmap
- Position Defence to exploit emerging or disruptive technologies
- Reduce the costs of defence systems through-life capability management

Defence & Security

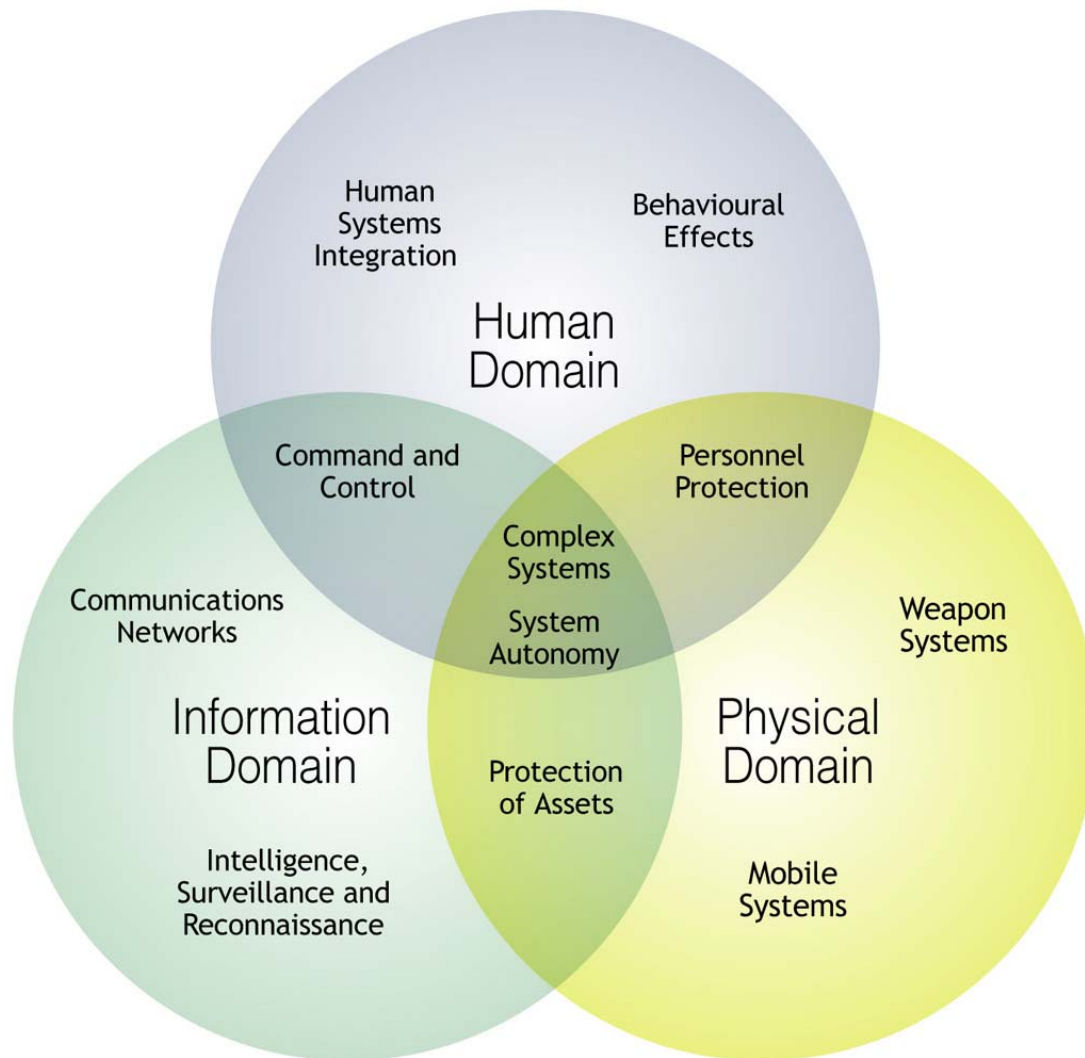
- Provide a rigorous foundation for defence and security emerging concepts and doctrine (comprehensive, integrated, adaptive, networked)
- Improve northern and maritime situational awareness and response
- Build a reusable national Major Events Security capability
- Defeat the CBRNE terrorist threat
- Enhance the nation’s cyber-security

Global

- Enable the “Green” Canadian Forces
- Find alternative power and energy solutions for the CF



Areas of S&T Expertise





Roles and Impact of International S&T Cooperation



External Partnerships: Allied Defence and Security S&T Collaboration

**Leveraged value to Canada
\$100M (FY08/09)**



**CBR Defense
Material MOU**



CAN-NLD-SWE MOU



**North American
Technology and
Industrial Base
Organization**



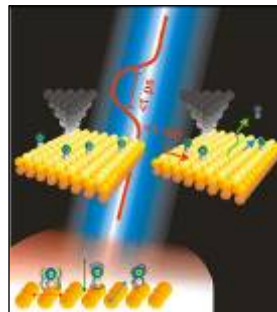
**Bilateral
MOUs
on
Defence
S&T**



Defence and Security S&T Cooperation contributes to ...

*... burden sharing in knowledge
and technology development by ...*

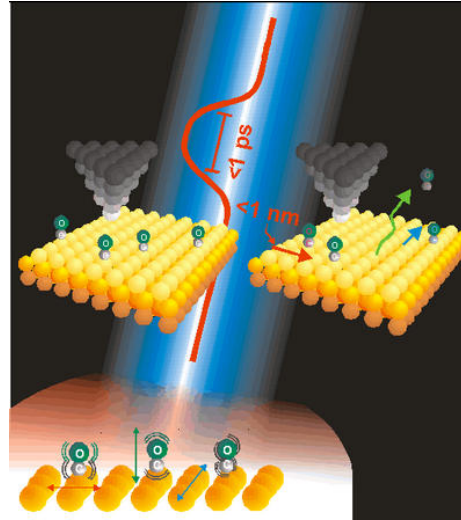
- Understanding and responding to threats
- Exploring emerging S&T for disruptive effect
- Helping shape new military concepts and doctrine
- Providing options for future military capabilities
- Exercising and training on new military capabilities
- Supporting current military operations
- Strengthening domestic security capabilities



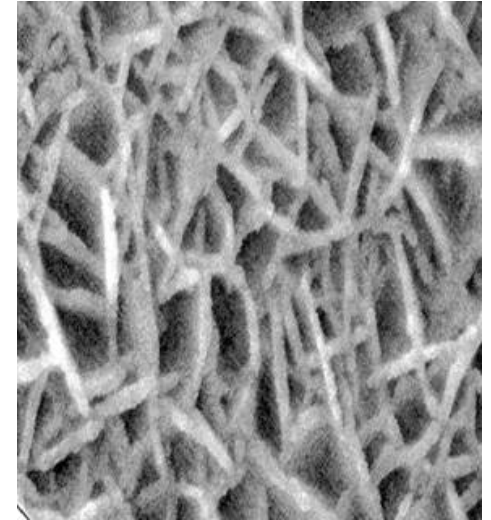
Exploring emerging S&T for disruptive effect



**Biomechanical
Energy Harvester**



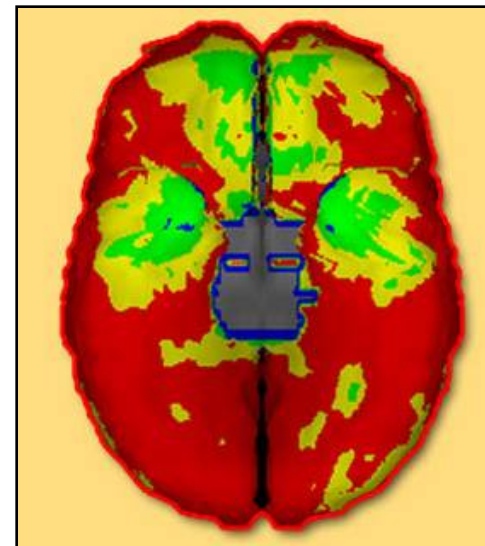
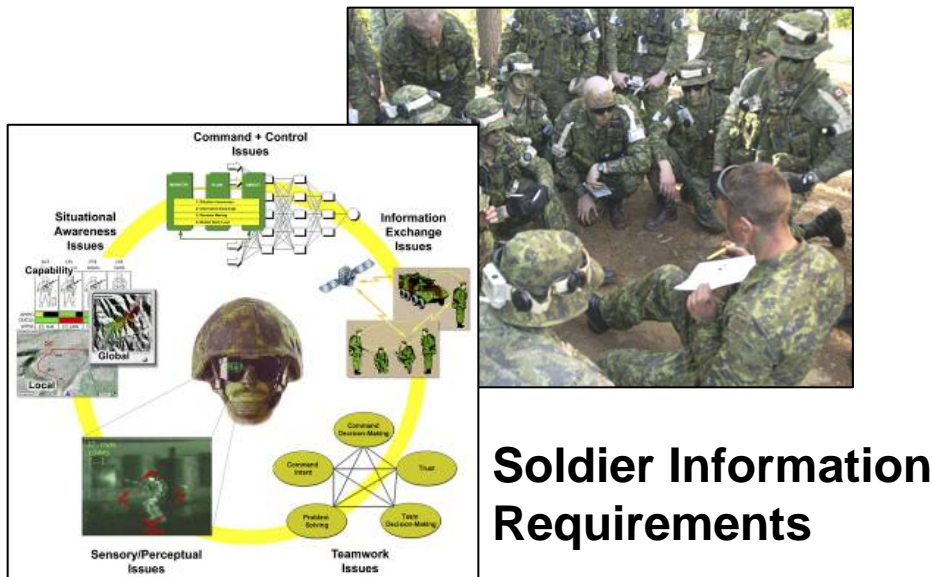
Femtosecond laser



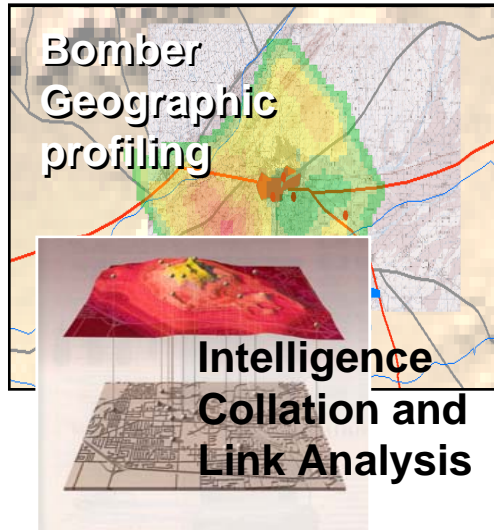
Surface Treatments

- Harvesting energy from human movement – meeting soldier power requirements
- Femtosecond laser – manipulating materials for protection, sensors, energetic materials
- Environmentally sensitive surface treatments with enhanced durability

Providing Options for New Military Capabilities

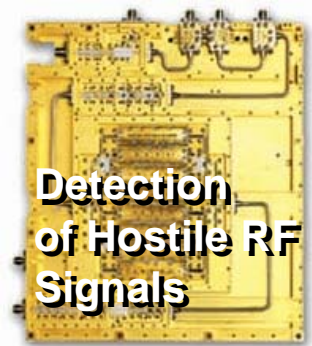


Supporting current military operations: Counter – IED

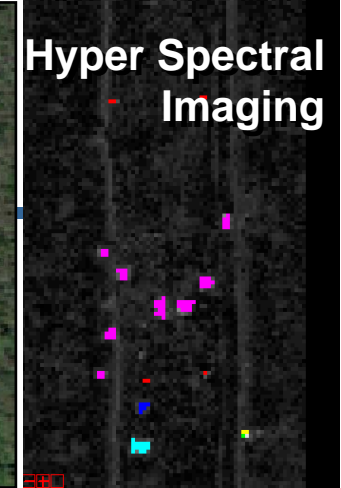


Prevent

Detect



Hyper Spectral Imaging



Respond

Mitigate





Expectations for S&T Cooperation: a Canadian Perspective

Knowledge Development

- Contributes to each nation's MoD decision processes
- Informs the national S&T program: future environment; emerging concepts, systems and doctrine; disruptive S&T
- Enables an efficient and effective national S&T program: people and personal networks; lexicons and standards; shared awareness; peer review.

Technology Development

- Shares the burden in technology and system development
- Contributes to reduction of risk in national acquisition programs
- Contributes to reduction of through-life cost of military systems



Enhancing International S&T Cooperation – Some Thoughts



Strategic Challenges in S&T Cooperation

- Differing expectations on national S&T Programs
- Differing scales of investment in Defence S&T by each country
- Differences among the nations' acquisition business models – from COTS/MOTS to custom defence equipment development
- Potentially competing economic development objectives



Some Principles to Shape the Way Ahead

- **Trust matters** – Favor coalitions of trusted partners, from warfighters to scientists
- **Knowledge matters** – Balance the S&T cooperation spectrum from knowledge co-development to technology co-development
- **Speed matters** – Synchronize S&T cooperation to the operational need for solutions
- **People are crucial:** smart, informed scientists and engineers enable stronger coalitions (engage the best and the brightest)

DEFENCE



DÉFENSE